CONNECTION DEVICE

FIELD OF INVENTION

The present invention relates to a device for connecting an osseointegrated implant system to an external prosthetic component, such as a limb prosthesis or prosthetic knee. The connection device is designed to protect the implant system from high mechanical forces and to avoid any skeletal fracture caused by an accident situation. The function is to limit rotational forces in the centre line of the implant and/or bending forces when the prosthetic component (prosthetic knee or elbow for example) is natural bent to its maximum position.

BACKGROUND OF INVENTION

Osseointegrated prostheses for rehabilitation of amputees (OPRA system) have been developed and commercialized by Integrum AB, Mölndal, Sweden. The OPRA system is currently used to anchor limb prostheses by means of a titanium implant that is surgically inserted into the bone. Generally, the OPRA system consists of a titanium screw implanted inside the bone and which serves as a fixture for the abutment, an abutment which is partly inserted inside the fixture and partly exiting the bone and stump so that the attachment of the artificial limb can be arranged at the head of the abutment, and an abutment screw for attaching the abutment to the fixture thus providing the mechanical coupling between the fixture and the abutment.

The connection device is arranged at the top of the prosthesis and forms the attachment between the abutment and the prosthesis. Specifically, it allows the attachment of the prosthetic component distal to the abutment. Also, the connector has a built-in safety mechanism to prevent bone damage in the event of excessive loads such as in a fall or other overload. All amputees are likely to have overloads or fall occasionally and a complication following osseointegration is the risk of bending the abutment. If the abutment is bent or deformed following a fall, then it must be replaced. And if the anchoring of the fixture is disturbed then there is a risk of loosening the fixture and a there has to be a new surgical operation.

In the event of unfavourable rotational loads being applied to the implant system it is previously known (see OPRA ROTASAFE system, also developed and commercialized by Integrum AB, Mölndal, Sweden) to design the built-in safety mechanism with two separate torque plates that are arranged to rotate relative to each another when the rotational load exceeds a release level. The amount of torque required to activate the connector device can be adjusted and graded to the status of the patient. The torsion release level of the connector device should be set to protect the implant system from significant rotational overload but still allow everyday activities without frequent release episodes that will disturb the patient and could increase wearing of the device. For instance the release level of the connector device could be altered between 10 Nm and 30 Nm, for instance by means of a number of press screws.

However, there is a need to reduce the outer dimensions of the connector device and also makes it more easy to set the release level instead of using as much as 8 press screws for controlling the release level.

There is also a need to take care of excessive bending forces, because in the event of an accidental fall not only rotational overload but also such unfavourable bending forces might occur. Even if it has been proposed to design a connector device with a release function for such excessive bending torques, there has been no success so far.

SUMMARY OF INVENTION

It is an object of the present invention to provide a connector device having a built-in mechanism to limit bending forces and which can be built-in to a connector device having a more compact design compared to previous solutions.

It is a further object to provide a connector device where the built in mechanism also is able to limit rotational forces.

It is also an object of the invention to provide a connector device having a more simple system for controlling the release level.

It is a further object of the invention to provide a connector device having a quick connection to the abutment and which is more easy to operate.

According to the invention the connector device has a main housing which includes a built-in safety mechanism to protect the implant system from high mechanical forces and to avoid any skeletal fracture caused by an overload situation and wherein the built-in safety mechanism is arranged to limit bending forces.

According to a preferred embodiment the built-in safety mechanism comprises a first release mechanism to prevent also rotating forces to be translated from the prosthetics in to the bone itself as well as the mechanism to limit bending forces when the prosthetic knee is natural bent to its maximum position, for instance in case the patient has a backwards fall and ends up sitting on the prosthetics, and then will secure the implant or bone itself from damage.

According to a further embodiment the first release mechanism is arranged in the upper part of the housing (facing the implant system) and the second release mechanism is arranged in the lower part of the main housing (facing the external prosthetic device).

According to a further embodiment the connector device has an excenter arm for quick connection and locking of the connector device to the abutment of the implant system.

Further preferred embodiments of the invention are specified in the dependent claims. It is to be understood that still further preferred embodiments can be constituted by any possible combination of the features in the claims, the above mentioned features and by features related to the description of an example.

By the term rotational force in the present application is meant a torque force around an axis defined by the axis of an anchoring screw of the implant system or around an axis in parallel thereto or slightly angled thereto. By the term bending force is ment a force perpendicular to this axis.

SHORT DESCRIPTION OF THE FIGURES

In the following an example of the invention will be described more in detail with reference to the accompanying drawings, in which

FIG. **1** is an overview of an osseointegrated prior art prosthesis for rehabilitation of amputees,

FIG. **2** is a schematic view of a connection device according to the invention,

FIG. **3** is a side view of the connection device,

FIG. **4** is a section through the connection device along A-A in FIG. **3**,

FIGS. **5***a* and **5***b* illustrates the main parts of the release mechanism for rotational overload,

FIGS. **6***a* and **6***b* illustrates the main fitting cooperating with the rotational release mechanism, and